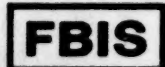


JPRS-ESA-84-032

24 August 1984

East Europe Report

SCIENCE & TECHNOLOGY



FOREIGN BROADCAST INFORMATION SERVICE

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24 August 1984

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SCIENCE & TECHNOLOGY
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PROGRESS IN DEVELOPMENT, PRODUCTION OF ROBOTS REPORTED

Sofia SOFIA NEWS in English 4 Jul 84 p 3

[Article by Nikola Makov: "Our Robots of Tomorrow"]

[Text]

A National Techno-Scientific Conference *Industrial Robots '84* was held in Stara Zagora. Taking part were specialists from Bulgaria, the USSR, Czechoslovakia, Poland, the GDR, Cuba, Greece and Japan. They discussed robot mechanisms and control, the automation of robots and robotised systems design and their use in the flexible automated production systems.

These 'iron workers' paint automobiles, assemble watches, operate founding machines and metal-working lathes, they do precise weldings. They never feel tired, they are never ill and are not late for work. These 'supermen' are the robots, man's most vital assistants now and in the future. Perhaps not everybody will know that the man who coined the word "robot" was not a scientist but the well known writer, Karel Capek. As early as 1921 he depicted in one of his plays these strange androids, which have come to be among the symbols of the revolution in science and technology.

During the last ten years Bulgaria has put much effort in the production of robots needed in complex automation. At present this country has emerged among the largest robots manufacturers in the socialist community. She even coordinates this branch within the CMEA framework. The recent conference occasioned our story about the work of the specialists at the Beroe Robotics Works in Stara Zagora.

Now they are busy with the last tests of the module construction of a piece-transfer robot. This is a promising branch in robot construction, because module robots provide flexibility in the production and the possibility of setting up robotised places of work. The Works also develops new models of pneumatic portal manipulators of improved design. Particularly interesting is the latest model of a painter-robot. All these products will go into batch production before the end of this year.

At present we manufacture industrial robots and manipulators in immensely diversified modifications", says the deputy manager of the Works Kolyo Rainov. "They can be used in all mechanical engineering branches. We have already turned to microprocessors, control systems and module structures. In our opinion, most promising are the painter robots and the arc welders.

Most of these innovations were developed on joint blueprints by Bulgarian and

Soviet specialists who work at the Technical Cybernetics and Robotics Institute in Sofia and at the Paton Welding Institute in Kiev. A particularly indicative example of this cooperation is the arc welding robotised complex consisting of 19 modules. The export of the first specimens of this complex to the Soviet Union is already in preparation at the Works in Stara Zagora.

"We are now working on a family of manipulators for the welding complex, which will make it universally applicable," says the deputy director of the Technical Cybernetics and Robotics Institute Nedko Shivarov. "Thus the welding of all sort of machine parts will be automated, regardless of their shape. This is the beginning of the future automation of assembly lines."

The setting up of robotised places of work is essential in the realisation of the programme for doing away with manual and unattractive labour. At the Tiles Plant in the town of Ispirih a robotised place of work is being introduced in the palletising of tile packs. A robotised place of work is also being tested at the Dinamo Plant in Sliven where the mounting of rotors in electromotors is automated.

The specialists from the Institute in Sofia would like to develop a robotised teaching complex for school and university students and workers, to operate with computers and robots. This complex comprises the IMCO-2 personal computer and the ROBCO-01 mini-teaching robot as well as some peripheral devices: a conveyor, a desk, etc. Together with Soviet scientists Bulgarian researchers work on a new type of robots for the laser processing of metal surfaces, which will increase the wear-and-tear resistance of these surfaces by nearly six times. Another very popular study of researchers at the Mechanics and Biomechanics Institute in Sofia is the hand-shaped manipulator which can lift and move glasses and many small objects.

CONTRIBUTION TO SPACE RESEARCH PROGRAM REVIEWED

Sofia ZEMEDEL'SKO ZNAME in Bulgarian 10 Jul 84 p 3

[Article by (z. d. n.) Professor Dimitur Mishev, ZEMEDEL'SKO ZNAME commentator on space matters: "Recognition for Bulgaria's Successes"]

[Text] Today is the third anniversary of the installation of a complex of scientific apparatuses, developed by Bulgarian and Soviet scientists working on the Bulgaria 1300-2 project and within the framework of the Bulgarian 1300 National Space Program, on board the Meteor-Priroda artificial satellite.

The complex of scientific apparatuses was put into orbit in order to solve a number of problems and tasks related to the remote study of earth from space. The scientific research program also included a concept for cataloguing natural formations and their condition.

At the present stage of analysis of the earth from space, there should be a differentiation between applied study (work done for the sake of a concrete analysis of natural resources and control of the environment), and scientific study (methodological studies and experiments conducted on determined natural polygons and areas, in order to establish a catalogue of spectrum characteristics of the sites on the earth's surface at different stages of development).

Analyzing the spectrum characteristics of natural formations should be conducted at the same time as obtaining images from the territories studied in several spectrum areas.

This task can be solved by a satellite complex which has been put into a sun-synchronous orbit at an altitude of about 600 kilometers and which measures reflected and self-generated radiation within a large range of the electromagnetic spectrum.

In order to make effective use of the data and images obtained, methods and algorithms for multivarious processing of them by specialized computer systems and devices were developed.

The presence of a memory device in the complex of scientific apparatuses made it possible to pose and solve a number of problems related to studying the

oceans and atmosphere of the world. It could be mentioned that the first steps toward solving the problems of spectrum-structural analysis, spectro-calorimetical systems and modeling the operation of an arbitrary system for studying natural resources, and others, were made by the complex of the Bulgaria 1300-2 project.

Significant contributions to synchronous measurements and analyses were made at these levels: 1) artificial satellites of the earth or orbiting stations, 2) airplane laboratories, 3) ground measurement complexes. In addition, our participation was prepared, to a different degree, for future space activities.

The complex has an operating guarantee for 6 months of working without defects; it has been working flawlessly now for 36 months. This is a new recognition of the successes of Bulgarian scientists and specialists, of the electronic and machine building industries.

The work on the Bulgaria 1300-2 project is another demonstration of the great possibilities offered by the invigorating Bulgarian-Soviet friendship. Professor Doctor Yu. V. Trifonov of the Soviet Union said: "Working with Bulgarian colleagues was a real pleasure for me. They are specialists at the highest possible scientific and professional level. They are people with verve, imagination, and an astounding working capacity. . ." Academician R. Z. Sagdeev, director of the Institute for Space Research at the Academy of Sciences of the USSR, notes: "There is no better recognition of Bulgaria's participation in the remote studies of the earth than the attention which greeted the first results from the flight of the Meteor-Priroda. . ."

12334

CSO: 2202/17

NUCLEAR POWER STATION ADVERTISES EMPLOYMENT OPPORTUNITIES

Sofia VECHERNI NOVINI in Bulgarian 10 Jul 84 supplement

[Text] The nuclear power station in Kozloduy, bearer of the Bulgarian People's Republic medal, first degree, in relation to the accelerated building and operational implementation of new power -- the fifth and sixth power units -- has openings nationwide for qualified specialists with higher education completed in the following specialties:

- thermal and nuclear power engineering;
- production automation;
- electronics;
- electromeasurement technology;
- radioelectronics;
- computer technology;
- communication technology;
- industrial thermal technology;
- electrical power engineering (power stations and substations or electrical networks and systems);
- power supply and electric equipment;
- electric machines and apparatuses;
- metal technology and metal processing machines;
- organic synthesis and fuel technology;
- water technology;
- mathematics;

- industrial physics;
- industrial chemistry.

Qualified specialists are needed, with secondary education (technical school) completed in the following specialties:

- electronic technology;
- computer technology;
- production automation;
- radio and television technology;
- nuclear electronics;
- power stations and networks;
- nuclear thermal power engineering;
- electrical equipment of industrial enterprises;
- semiconductor technology;
- thermal and water power machines and equipment;
- industrial combustion engines;
- machine building technology -- cold metal processing;
- organic synthesis and fuel technology.

Qualified cadres of workers to execute tasks are needed, with secondary technical vocational education completed in the following specialties:

- electronic equipment fitter;
- power unit fitter;
- machine fitter;
- electric network and installation fitter;
- control measurement apparatus fitter;
- power equipment operation fitter;
- metal-cutting machine operator fitter;

- chemical and technological process operator;
- welder.

The nature of the work at the nuclear power station in Kozloduy requires that the candidates have particular interest in technology, abilities that are above average for the given profession, as well as high discipline and personal responsibility in their work.

As high professional training is necessary for those who work at the nuclear power station in Kozloduy, the specialists will be sent to the Soviet Union and other socialist countries for training and specialization.

The remuneration for work is carried out according to the differential rate scale, third category (Uniform Labor Network, plus a 20-percent increase).

In addition to that, those who are hired receive the following additional remuneration:

- up to 40 leva, according to article 9 (1) of the Directive on Additional Labor Remuneration [DALR] for working under specific conditions;
- up to 40 leva, according to article 35 of the DALR for reinforcing the labor force;
- up to 20 percent, for continuous and uninterrupted service -- second group (for category);
- up to 60 percent additional remuneration (labor participation ratio).

Depending on the nature and character of the work, the age of retirement for the specialists is 50-55 years of age.

The nuclear power station in Kozloduy offers the following benefits:

- the workers' children enjoy a privilege when applying to secondary specialized educational institutions (technical schools) and secondary vocational technical schools;
- a stipend is provided for the workers' children who are enrolled in a higher educational institution, technical school, or secondary vocational technical school;
- a permit for enrollment by correspondence in higher educational institutions;
- the possibility of regular and correspondence enrollment in postgraduate programs in Bulgaria and abroad;
- allows those who have completed secondary specialized and secondary vocational technical education to enroll in higher educational institutions for which 8-month preparatory courses are organized.

The nuclear power station in Kozloduy provides its employees with the following social and domestic acquisitions;

- an apartment, according to the size of the family;
- a one-room apartment for those not married;
- daily free transportation;
- official transportation for those who commute from the populated areas of the rayon;
- nutritious food at the canteen;
- a vacation package at the company-owned resorts along the Black Sea and at other tourist sites; an additional annual vacation of up to 22 working days.

The following documents are needed for seeking employment: an application, autobiography, diploma for education completed (higher, secondary specialized, or secondary vocational technical), in the appropriate specialty, certificate of degree of qualification acquired (for category), standard medical certificate, record of service, standard personal form.

Applications are accepted every day at the Personnel Office of the nuclear power station in Kozloduy, first floor, and at the Professional Study Center, ninth floor.

For information, calls are accepted nationwide on telephone code 0973-71 -- operator at the nuclear power station in Kozloduy; extension 26-62 -- Personnel; extension 20-31 and 20-32 -- Professional Study Center; send mail to Corporation Power Engineering, 8 Triyaditsa Street, ninth floor, Room 916, Sofia, telephone 87-53-61 or 86-191, extension 366.

12334
CSO: 2202/17

BRIEFS

LASER USED TO TREAT WOUNDS--Specialists at the Higher Medical Institute in the town of Plovdiv have had success in their attempts to use laser to cure wounds from burns which are hard to heal. Therapy with the helim-neon apparatus, capacity 2 milliwatt and wavelength 632 angstroms, was applied in 20 patients who had previously been treated without any effect at a clinic with the Shostakovsky and Wyszniowski balsams and other preparations. Irradiation was performed from a distance of 5 cm and lasted three minutes a day. The course of treatment continued for 12 days. Already on the fourth day the majority of the patients felt some relief. The pain eased, the appetite and sleep of the patients improved. The wounds from the burns of some of the patients healed and closed at the end of the first course. In some cases the course had to be repeated after a fortnight's break, but with all the patients the results were good. Physicians think that low-power laser beams act as a biological stimulator in the regeneration of the tissues. [Text] [Sofia SOFIA NEWS in English 4 Jul 84 p 3]

CSO: 2020/105

NEW DRUGS INTRODUCED

Bratislava PRAVDA in Slovak 11 Jul 84 p 2

[Article by PRAVDA editor Jozef Supsak: "New Health-Supporting Solutions"]

[Text] Pharmaceutical research and development is one of the most humane methods of application of the latest R&D achievements for the benefit of mankind. The Pharmaceutical Research Institute in Modra is one of the establishments developing new formulas of products for the treatment of various diseases.

R&D of new types of drugs has its idiosyncracies and specifics. Before an original pharmaceutical product is developed, numerous tests and experiments precede the final solution. First, 6,000 to 8,000 chemical compounds must be prepared. All of them must be tested and from them only about 10 substances are selected and then subjected to extensive preclinical, toxicologic and pharmaceutical tests. Usually the two most effective products are sent for clinical evaluation and one of them approved for the production. Small wonder that the development of a single original medication (according to the world trend) requires on the average 10 years. Naturally, the costs of its development are enormous. Foremost foreign companies quote sums of 60 to 90 million marks.

Our health system finds increasing support in our domestic base of pharmaceutical products, which bear the hallmark of world up-to-date achievements, as confirmed by several marketing outputs of the Pharmaceutical Research Institute in Modra.

Cardiovascular diseases are the most frequent cause of human death and infectious diseases lead to the highest disability of our working people. The Pharmacological Research Institute in Modra (VUL) has focused its creative potential mainly on those two areas. Among its own inventions, the drug Agapurin is noteworthy. It is used for the treatment of the peripheral organs (arms, legs) affected by insufficient circulation due to morbid changes. Researchers Eng Jan Jendrichovsky, ScC, Eng Alfonz Rybar, ScC, Eng Ladislav Stibranyi, ScC, Eng Jozef Nevidal, Dr Zdeno Mahria, ScC, and Eng Marta Jendrichovska capped their research with several discoveries. The fact that we are exporting Agapurin to nonsocialist countries speaks well for that drug.

Another new Czechoslovak product, Karditalin, is to be used for the therapy of arrhythmia. It is another accomplishment of the research team composed of Eng Dusan Heseck, Dr Fridrich Szemes, ScC, Eng Marian Tegza, Dr Xenia Svobodova, ScC, and Dr Ladislav Jezek of the VUL in Modra. Mass production of Karditalin will begin next year. This is an example of what we would like to see more frequently. The composition of this drug and the technology of its production are based exclusively on resources of raw materials from the CSSR and the CEMA countries.

In the other group--anti-infection chemotherapeutics--Detrigin, an original Czechoslovak product according to the latest world standards, intrigued us. It is to be used for the treatment of fungous diseases of human skin. Eng Ivan Skacani, ScC, Dr Milada Sindlerova, and Dr Jan Sipos developed its production from our domestic raw materials which the CHZJD [Juraj Dimitrov Chemical Works] in Bratislava will supply to the manufacturer.

Infectious diseases are frequently contracted by human contact with livestock. Protozoa are carriers of infection. Eng Emil Slatinsky, Eng Marian Simko, and Dr Frantisek Bachraty have recently developed a method of producing a drug, Avrazor, which makes it possible to eliminate that type of infection in a day or two.

We could continued to quote other successes of the experts from the Pharmacological Research Institute in Modra. Noteworthy are the inventions at present under study--new drugs against infection, medications for the treatment of diseases of the digestive tract, antitussive preparations, and so on.

"Human work and good organization of creativity must be seen behind the accomplishments," says Eng Alfonz Rybar, ScC, director of the Chemistry and Technology Department. "I think that we have both of those in our institute. Above all, we are not lacking for capable teams of problem-solvers. As a rule, two, three or four authors sign the claim of a new pharmaceutical product, but actually many other persons are involved in R&D. Individual sectors--physical and analytical chemistry, pharmacology, clinical pharmacology, development of pharmaceutical forms, and chemical pilot plants--always share in a job."

Close cooperation with potential developers--manufacturers of the pharmaceuticals--has proved successful for the Pharmacological Research Institute in Modra. Some workplaces are located directly in plants. A department for the development of pharmaceutical forms has been set up in the Slovakofarma in Hlohovec and its own pilot plant is under construction there. The VUL in Modra has a research branch in the Biotika in Slovenska Lupca--Fermentation Technology Department. Such advanced forms of interconnected applied research and development with production are very efficient and accelerate the launching of the production of a new drug.

The institute relies on the initiative of inventors and improvers as another impulse for the development of new inventions. This form of initiative has been again successfully developed in the first 6 months

of this year. Experts from the Pharmacological Research Institute in Modra registered 11 inventions (although the plan had envisioned only 6) and 14 improvement proposals.

9004

CSO: 2402/9

RADIOACTIVE ISOTOPES FOR MEDICAL USE

Prague RUDE PRAVO in Czech 27 Jul 84 p 2

[Unattributed CTK article: "New Pharmaceuticals To Augment Diagnosis"]

[Text] Radioactive isotopes, the so-called radiopharmaceuticals, are used by more than 50 medical centers in Czechoslovakia for diagnosis and in some cases for the treatment of disease of various organs. A significant part in researching and producing the radiopharmaceuticals is played by the specialists of the Institute of Nuclear Research in Rez near Prague.

Ten new preparations which were developed and marketed in Czechoslovakia during the last 8 years, rank among the most often used and commercially most successful radiopharmaceuticals in the country. Almost 40 percent of their total production originates in the laboratories of the institute. Radioactive isotopes are produced here by special devices which afford protection from radiation. In the same way as other medicaments, each preparation of this kind is strictly tested and the quality control applied to the individual shipments of radioactive isotopes, before they are sent to the institutions of nuclear medicine, is especially meticulous.

Because patients must not be exposed to undesirable doses of radiation, only radionuclides with a short active period are utilized. As a result, it is necessary to ship some preparations daily, other in weekly or biweekly intervals. This requires managing a whole production cycle from irradiation in the reactor or cyclotron to chemical processing, then to pharmaceutical processing quality control and distribution of the preparation--all in a very short time.

In 1984-1986, within the scope of the State Plan, other radiopharmaceuticals are to be developed which should make it possible to expand the diagnostic range of pharmaceutical preparations even further. Extremely important in this respect is, for instance, thallium-201 Tl, which will find use in the detection of heart disease. Its manufacture has already been launched by three international companies.

CSO: 2402/11

CONFERENCE HELD ON INFORMATION SCIENCE TRENDS, APPLICATIONS

Research, Development Trends Outlined

East Berlin RECHENTECHNIK-DATENVERARBEITUNG in German Vol 21 No 6, 1984
pp 6-8

[Article by Prof Dr Ulrich Hofmann, First Vice President, GDR Academy of Sciences, responsible for research and planning; based on contribution to 'INFO 84' conference, 6-10 Feb 84, Dresden Technical University]

[Excerpts] The 10th Party Congress of the SED demanded a high-performance increase in all areas of social life during the eighties. The reason for this is that growth and efficiency are facilitated quite essentially by utilizing the achievements of science and engineering. A decisive precondition for this is the development and application of microelectronics and computer technology. Building on this, information processing, and information and communications technology already have acquired the position of key technologies, whose significance continues to increase, since they permanently influence all spheres of society and determine the attainable speed-up of scientific-technical progress. Regardless of the advances which were reached in this area in our country during recent years, the critical estimate must be that the current development tempo is by far insufficient to secure the required performance increase of the economy to the required extent. The time is evidently ripe for initiating another step in the qualitative development of the relevant areas. Thus we must understand the task as a national concern, which is to be solved jointly with friendly countries of the socialist community of nations.

Social Effects

The utilization of scientific-technical progress, especially in the areas of microelectronics, computer technology, telecommunications, robot technology, has manifold long-term social effects, in particular:

- profound structural changes within and between social areas such as production, research, development, design, management, and services
- changes in the production profiles of industrial branches such as computer technology, communications technology, office technology, and home electronics

- the liberation and conversion of working forces of an order affecting the national economy and involving entire industrial branches
- large economic effects by increasing work productivity, improving process guidance, strengthening exports, saving energy and materials, and through a considerable reduction of innovation times for products, processes, and methods
- pronounced changes in the professions, and thus in the profile of training and education, and finally in the type of communication of knowledge itself
- profound changes in the design of the work place for a rather large number of employees
- mastery of complex problem-solution processes in view of system solutions, especially by making mental processes more efficient
- changes in the administrative area, among other things through information systems for guidance and planning as well as by computer-supported telecommunications
- changes in trade, traffic, and fiscal affairs
- changes in social information and communication processes, as well as in mass and individual communication
- making training processes more efficient, especially in public education, and its directions towards the perspective state of technology.

Points of Emphasis in Research and Development

The implementation of the above-mentioned directions of thrust in utilizing automated information processing as well as in utilizing information and communication technology requires the investigation and detailing of manifold disciplinary as well as project-oriented questions in microelectronics, in computer engineering, and in communications technology. The following problem areas here appear in the sense of examples of research and development points of emphasis. Because of their complexity, these must be worked on with high priority in close cooperation between the Academy of Sciences, the universities and colleges within the framework of research programs in mathematics, mechanics, cybernetics, information processing, and with the participation of industry and other areas:

- The design and production of LSI and VLSI switching circuits are becoming increasingly important for the application of information processing. Microelectronic circuits are the basis for the further development of computer systems altogether and are used more and more in communications electronics and automation technology. With the objective of making a transition from software solutions to specialized hardware solutions, however, the fraction of customized switching circuits increases considerably. Such circuits must always be developed and produced in the short term.

Here, the overall area of the application of information processing is influenced by progress in circuit technology.

- The possibility of creating a broad spectrum of microelectronic components and new information processing systems increases the necessity of developing further the technologies of software production, especially also computer-supported interactive programming. Improvements in program development technology as regards user guidance, the working out of software developing systems with the inclusion of questions of quality control, and guaranteeing a high utilization rate of multivalent programs are acquiring major importance.
- A special point of emphasis is the work-station related deployment of computing and communication technology in production and research. Investigations concerning user-computer communication and research on the design of computer-supported work stations are providing the preconditions for increasing user efficiency. Important target projects in terms of the national economy are CAD/CAM systems for supporting the drafting, designing, and technological production management as well as production control, planning, the management of materials, and sales.
- Closely connected with this are research problems on process and production automation under the objectives of mastering complex process sequences, of implementing optimized modes of execution, of increasing production flexibility and system reliability, as a further automating process control and regulation. Target projects are optimized processes for mass-produced goods, computer-supported multi-purpose machine tools, robot-supported flexible production, and easy-to-operate factories. Basic preconditions for solving such problems are, among other things, the mastery of decentralized control and regulation functions, of multi-processor/multi-computer solutions, of qualitatively new solutions for man-machine communication, and of various questions of picture recognition for industrial robots, for automatic inspection, and for quality control.
- The build-up of on-line access to data bases and information systems from the work station creates the preconditions for being able to master efficiently the quantities of information that are objectively increasing in nearly all areas of the national economy and of society. High-priority research tasks concern the improvement of access possibilities on the basis of public data communication, the simplification of the user interface, for example in the sense of a natural-language access, and working out the concept of distributed data bases.
- An integrating factor of information processing is data communication which simultaneously opens up innovative forms of telecommunications. To master this new communications technology, investigations are necessary concerning the operation and system behavior of data networks as well as concerning the modeling, design, and deployment of user networks. Here, research on higher, user-oriented communication protocols will play an important role during the coming years. Besides the computer association

in the sense of non-local computer networks, the problem area of local networks is becoming increasingly important. In the long terms, the question arises concerning the transition to service-integrated digital networks, for which both the computer and communications precursors must be created.

- Research on computer architecture is necessary for the further development of the technical computer base. Taking into account the ESER/SKR (uniform electronic data processing system/minicomputer system) line, the special points of emphasis appear to be the development of special processors, taking into account multi-processor structures, the generation of intermediate languages, and hardware support for programming languages, as well as investigations on the possibilities of hardware implementation of software components.
- A research topic whose time is coming more and more is artificial intelligence. Its methods and procedures are not only playing an increasing role in the rationalization of mental processes in practically all areas but they are also centrally significant for the development of a new computer generation and of robots of the second and third generation. Furthermore, it must be noted that computer systems, their application and communication software, information systems, and other systems can receive basically new quality characteristics by integrating the elements of artificial intelligence, as is clear from the example of the expert systems.

Starting from previous researches on information technology, cybernetics, process and experiment automation, a series of academic institutes will increasingly concern itself with these problems. Examples of this are the Central Institute for Cybernetics and Information Processes with its researches on picture recognition and picture processing as well as on process automation and artificial intelligence, the Center for Computer Technology with its researches on computer network technology and data communication based on the computer network for research and teaching DELTA as well as its researches on computer-supported work stations, or the Central Institute for Nuclear Research and the Institute for High-Energy Physics with their researches on experiment automation.

The research work on the DELTA computer network, for example, very impressively demonstrated how the collaborative work of collectives of the Academy, the universities, and the colleges, a limited project could become a qualitatively and quantitatively expanded objective, and how a national computer network for research and teaching could be worked out for the above-mentioned areas and for the Academy of Agronomy. The experience gained thereby should be used to solve other, socially significant problems, for instance in the development of national data communication.

It must also be considered how interdisciplinary collaboration of information scientists and social scientists can be shaped, using data communication as an example, in order to investigate scientifically the questions of the social-economic conditions and consequences of data communication, and in order to work out the corresponding requirements and deployment strategies which are adequate for our socialist social structure.

In the name of the Presidium of the AdW (Academy of Sciences), I can give assurance that the Academy of Sciences will energetically pursue these and many other relevant researches in the interest of our common concerns.

Outlook

At the conclusion of my discussion, three consequences are to be drawn:

First, under the conditions of a highly developed industrial society, the deployment of progress in microelectronics as well as computer and communications technology, represents a principal factor for opening up the performance reserves. The task of further completing the socialist society consequently requires increased efforts in these areas over an extended period of time.

Secondly, considering our present state and international development trends, a series of research and development emphases can be formulated, which require work and which must be the principal direction of international socialist research cooperation.

Third, the strategic significance of basic and applied research on information processing and information technology required improved cooperation between the collectives of the Academy of Sciences, the universities, and the colleges, with early inclusion of industrial partners and users. Far-reaching forms of collaboration must be developed for international socialist research cooperation.

Figure Caption

Ulrich Hofmann studied at Lomonosov University in Moscow from 1953 to 1958, and graduated from Dresden Technical University. In 1969, he was appointed honorary professor of solid state physics. Since 1970, he is a regular member of the AdW of the GDR. His research areas are solid state physics and the development of materials with special physical properties. He presides over the Council for Research Technology and Scientific Device Construction of the AdW and he has dedicated to questions of computer technology as well as automation of scientific experiments.

Microprocessor Applications Discussed

East Berlin RECHENTECHNIK-DATENVERARBEITUNG in German Vol 21 No 6, 1984
pp 12-15

/Article by Prof Dr Gerhard Merkel, Director of Research and Development,
VEB ROBOTRON Combine; based on contribution to 'INFO 84' conference,
6-10 Feb 84, Dresden Technical University/

/Excerpts/ Starting Points

In distinction to other plenary lectures, in which the effects of microelectronics are indicated qualitatively, this paper will emphasize the technical-economic aspects from the perspective of the development of microelectronics itself. Such an evaluation must start from the following:

- Because of the size of our country, the specific orientation of our industry and agriculture, and previous development of resources, a 1:1 transformation of the advanced international status to our own needs leads to erroneous conclusions.
- The economy of the GDR is rigidly connected with the potential of the USSR, and our main orientation is directed to expanding this relationship while supplying and increasing performance contribution of our own for microelectronics.
- Having regard for the qualitative and quantitative differences, similar developmental trends in engineering development appear in the GDR as also appear in this area in other advanced industrial countries.

The Developmental Tempo of Microelectronics

In the present phase of the development and application of microelectronics in the GDR, computer and office technology are the primary and main users. Thus, in 1983, 90 percent of all memory circuits that were furnished for processing were utilized the Robotron Combine. With microprocessors, the same picture appears. The years 1984 and 1985 are characterized by an especially steep rise of demand for highly integrated circuits on the part of the Robotron Combine, because microelectronics has now fully established itself in devices of writing technology, printing technology, and office computers, and because the rates of increase in production normally are always multiples of those of the previous year.

During the coming years, these proportions will change despite a continuing strongly growing absolute demand for switching circuits at Robotron. I estimate that, by 1990, 40 to 50 percent of the highly integrated circuits in the GDR will be used by control and regulation technology, communications technology, and by the consumer goods industry. In the development of the demand for highly integrated circuits, the GDR, by 1990, will exceed the long-term relatively stable growth rates of the capitalistic countries. Apart from retrogressions caused by the crisis situation in 1981/82, the sale of switching circuits during the time period beginning in about 1970, rose annually by about 20 percent in the leading capitalist industrial countries. The associated basic research expenditures rose less strongly, with an absolute relation of 5 or 6:1.

The reasons for this strong effect of microelectronics on computer technology are based in the rate of progress of microelectronics itself.

Characteristics of this development are:

1. The increasing level of integration per component.
2. The surface area per component, which is declining due to technological progress.
3. The increasingly more favorable speed/loss power ratio.

4. The increasing reliability of electronics.
5. The falling price per component function.

Technical Effects on Computer Technology

The above-mentioned five characteristics integrally determine the effect of microelectronics on computer technology. On the part of computer technology, the use of the new capabilities is not possible without some problems. The following research focal points should be mentioned:

- Mastering the design of highly and very highly integrated switching circuits. If one wishes to design a switching circuit with a generally irregular structure and consisting, for example, of 50,000 transistors or more, one must have available highly effective computer-supported design methods. By means of this, and without previous physical construction of the circuit from individual elements and circuits, a nearly error-free initial design (logically and dynamically) can be worked out. Close collaboration with the component manufacturer is indispensable, since only he oversees the technological requirements, especially in the transition to new technologies.

In the GDR, work is being done collectively on the further expansion of computer-supported design methodology and on the build-up of suitable design techniques. The results benefit all users.

Table 1: Application of Microprocessors

<u>Processing Width</u>	<u>1980 (actual)</u>	<u>1985 (forecast)</u>
4 bit	18 %	17 %
8 bit	65 %	48 %
16 bit	17 %	29 %
32 bit	0 %	6 %

- The testing of switching circuits and switching circuit designs.

For this purpose, a glance backwards: When the production of the systems of the type Robotron 300 came to an end, a basic error in the function of the machine was still discovered although this error appeared only in extremely rare cases, that is with the coincidence of a series of special situations. And this happened even though the machine behavior was machine-simulated during the development period. The same effects are encountered even today. As can easily be calculated, it is not possible to simulate all possible conditions of a switching circuit and to verify agreement with theoretical behavior. It is also not possible to identify with certainty a defect on a chip with, for example, 100,000 transistors and 64 connections, in the development stage, without using the measurement points on the chip itself. The development of test strategy and test programs for the development and production of switching circuits and for the user of

these switching circuits consequently is a scientifically important and high-priority concern.

- The mastery of outside influences. With the reduction of dimensions, the miniaturization of outputs and potentials which participate in the implementation of certain functions, the effect of noise from ambient circumstances increases. Soft-error phenomena due to alpha-rays are familiar. The component manufacturer seeks to counter this by shielding measures and (e.g. with the 256 kDRAM:24 k bit for parity comparison, leaning on the error detection techniques of EDPA), he finds redundancy solutions with error detection as well as error correction. Just as critical is the utilization of microelectronics in the neighborhood of stations with high switching powers, in the neighborhood of corrosive media. Now, in transmission, there are solutions with short-range transmission through optical wave guides; as regards the actual electronics complex, only extensive encapsulation of the conventional type is generally useful in these cases, if one cannot or does not want to fall back on high-voltage techniques with corresponding signal-to-noise ratios.
- Technology of processing. Although the processing of increasingly more highly integrated integrated switching circuits does not present difficulties in principle, certain principles and the associated technological discipline must be adhered to to avoid destruction of the switching circuit, for example by high charges, and by excessive tolerances during the programming of EPROM.

Important Research Directions

The growing integration level per chip is the main direction in the further miniaturization of microelectronics. However, in addition there are the following further important research directions:

- Users of the third dimension in the chip.

Experiments are being performed on this point. Since the resultant requirements on technology are very high, this method is not expected to become widespread during the coming years - if ever.

- Utilization of new circuit concepts, e.g. a transition to multi-status circuits. The chances of success of this research direction are currently also being regarded as low.
- Miniaturization through new packing forms. This research direction is promising, and is being worked on the following solution variants:

Further spreading of the chip carrier. For example, the surface in a housing with 64 pins can be reduced to 18 percent and the length of the longest connection can be reduced to 17 percent. In the GDR, we also will depart from the sole use of plug-in components and we will use slip-on components.

Introduction of multi-chip techniques, where naked chips are set on a carrier (generally ceramic) and, on this carrier, are connected together. Another variant of this consists in implementing entire modules on this carrier.

Wafer Integration

In contrast to previous practice, similar chips are no longer disposed on the silicon wafer, but the different chips belonging to one system are arranged in appropriate numbers taking into account the probable yield. The good chips belonging to one system are wired on the wafer and thus represent an entire complex. To increase the yield, one goes over to relatively small chip dimensions. At this time, such solutions are not yet efficient enough. According to press reports, Gene Amdahl is working on such a computer solution with integrated defect correction and defect-dependent structurability (target deadline for the prototype: 1985).

Utilization of the third dimension by the stacking of chips. Some Japanese manufacturers consider this the most promising research direction despite the existing heat-dissipation problems. It is supposed to represent the form of future packing technologies.

The goal of all these measures consists in increasing the chip density per square centimeter of carrier surface. The following values (status as of October 1983) delineate the situation:

AMDAHL	0.1 chip/cm ²
ROBOTRON K 1600	0.16 chip/cm ²
ROBOTRON EC 1055M	0.23 chip/cm ²
IBM 3031	0.7 chip/cm ²

According to these considerations concerning actions and effects resulting from microelectronics, notable effects can be sketched regarding the implementation of computer systems.

The Implementation of Computer Systems - Microprocessor Types

Among central units, one can observe two main directions. The first and economically most visible direction consists in the steady expansion and furious development of microprocessors. To a certain extent, this begins with the lowermost performance class of computer technology and is conquering higher and higher performance areas. In 1971, a beginning was made with the 8-bit microprocessor. We now are seeing a transition to microprocessors with a 32-bit processing width and operating speeds of one million operations per second. An increasing number of functions is being integrated on a circuit set which belongs to one microprocessor complex, and which is mutually coupled by using the classical principle of asynchronous circuits. Principles that are otherwise used only in high-power machines, such as pipeline and parallel processing, are being introduced and are yielding the desired performance increase, since gate delay times, clock-pulse frequencies can be improved only

with high technical expenditure and then only by a factor of 2 to 3. Table 1 shows the expected distribution of microprocessors on an international scale. In the GDR, on the basis of the production structure, which involves a large proportion of typewriter and office technology, the 8-bit line will continue to dominate more strongly than in other countries.

Table 2: Growth Rates in the Spreading of Computer Groups and Fractions of the Total Volume

<u>Computer Groups</u>	<u>Growth Rates (1982/1981) in %</u>	<u>Fraction of Sales Volume 1982 in %</u>
Personal computers and small office computers	100	14.3
Office computers	25	2.7
Minicomputers	7	4.1
Text processing	14	8.0
OEM microcomputers	30	4.6
OEM minicomputers	18	19.5
	<hr/>	<hr/>
Total of micro- and mini- computers	37	53.2
Small and medium EDPs	7	16.1
Large EDPs	6	30.7
	<hr/>	<hr/>
Total	21	100.0

When identifying the content of microprocessor types used in the GDR, one can refer to the continuity in maintaining architectural principles. The first microprocessor in the GDR was the U 808. The K 1510 microcomputer concept built on this. In the USSR, the K 580 series with its 8-bit processing width is equivalent to this, and now the K 1810 series with the 16-bit processing width. Microcomputer groups will be available, building on this basis of switching circuits.

The second architecture line was opened in the GDR with the U 880 switching circuit, which represents the basis for the K 1520 microcomputer module concept. This microcomputer module system with 8-bit processing width is being continued and is being expanded with faster variants. Sixteen-bit wide processing possibilities are also being added this year.

The third line is the minicomputer series K 1600 using as a basis the U 830 microprocessor switching-circuit set. While the K 1520 line is used primarily for office computers and analogous applications, the K 1600 is being used for scientific-technical calculations, picture processing, process control, and similar applications. In the USSR, devices with similar architectural concepts are in production, based on real 16-bit microprocessor solutions (like the K 1801 series). The computers of the USSR are known under the name Elektronika. In the USSR, other numerous microprocessor

solutions are in production. For the needs of the GDR, the above-mentioned three lines are sufficient to satisfy the demand, however, so that, in the interest of limiting the multiplicity of software, no further variants should be striven for.

As regards electronic data processing systems, another approach to the use of microelectronics can be noted. One is seeking to image available solutions of microelectronics by using integrated switching arrangements (master-slice, gate arrays), and in this way to use the advantages of microelectronics. At this time, ECL switching circuits are primarily used for such systems, and in individual cases STTL. Models in CMOS are under development, including also TTL edge electronics. Two to four custom-specific wiring levels are being implemented here. The trends which have been sketched here, have noticeable effects in spreading electronic computer techniques (see Table 2). The trend expressed in Table 2 was reinforced still more in 1983, since some companies made their appearance only in 1983 in the area of personal computers.

It would be one-sided to limit the effects of microelectronics to central units. A much greater influence can be observed for the needs of voice output and voice recognition and in many technological areas (e.g. production of integrated magnetic heads, thermal-pressure heads, memory technology). The trend towards micromechanics with a strong electronic component is in correspondence with microelectronics. Microelectronics concerns not only components, but it is a broad, revolutionary technology.

One can justly say: Microelectronics has decisively influenced the development of computer technology. It alone has made possible the breadth of its effect, and computer technology continues to remain a challenger for the development of this new electronics.

Nothing here happens for its own sake alone; everything is ordered by the principle that it can be designed by people for people and that it must be useful. The term utility is here stretched rather far. It includes marks and valutamarks and integrates the political position. All the more so as the application of microelectronics worldwide has only begun during the eighties.

Figure Caption

Gerhard Merkel studies at Dresden Technical College in 1951 to 1955, in the area of electrical electronic fine device construction. He graduated in 1958. He was appointed professor in 1975. At this time, he is active as director for research and development in the combine management of the VEB Combine Robotron. Since 1969, he is corresponding member of the Academy of Sciences.

Monitoring, Control for Nuclear Reactor

East Berlin RECHENTECHNIK-DATENVERARBEITUNG in German Vol 21 No 6, 1984
pp 25-28

/Article by Prof Dr Frank Baldeweg, GDR Academy of Sciences Central Institute for Nuclear Research, Rossendorf; based on contribution to 'INFO 84' conference, 6-10 Feb 84, Dresden Technical University/

/Excerpts/ The decentralized, hierarchically structured information system HIS was developed for the monitoring and control of the Rossendorf nuclear reactor. Using this as an example, the implementation of the essential requirements imposed on a modern automation system will be explained in more detail. /7/

In designing the HIS, consideration was given to the special features of the operational guidance of the RFR nuclear reactor.

The RFR is a light-water moderated and cooled reactor of the type WWR-S with a thermal power of 10 MW. The reactor was originally used essentially to solve problems in nuclear physics and reactor physics. Its current main use area, however, is to produce radioactive nuclides. Increasing the efficiency of isotope production requires, among other things:

- increasing the effective usable reactor power
- improving the charging and discharging technology
- preparing operation with variable reactor power
- shortening the reactor shutdown times.

To implement a reliable and safe reactor operation with the HIS, the following automation tasks must therefore be solved:

1. Process monitoring: This includes not only the measurement, monitoring, presentation, and recording of measured quantities, but also technical diagnostics and radiation-protection monitoring.

Technical diagnostics here comprises trouble analysis in real time (SAAP program), active and passive methods of process analysis, as well as noise diagnosis.

2. Digital regulation of reactor power as the foundation for automating the start-up and shutdown process of the reactor system; the start-up monitoring and the implementation of the optimal shutdown strategy here takes place in the conversational mode via the display screen of the reactor operator.

3. Control of the charging and discharging of the radiation material by means of a special charging robot. In its second expansion stage, this robot contains systems for object recognition (identification of the respective radiation cassette).

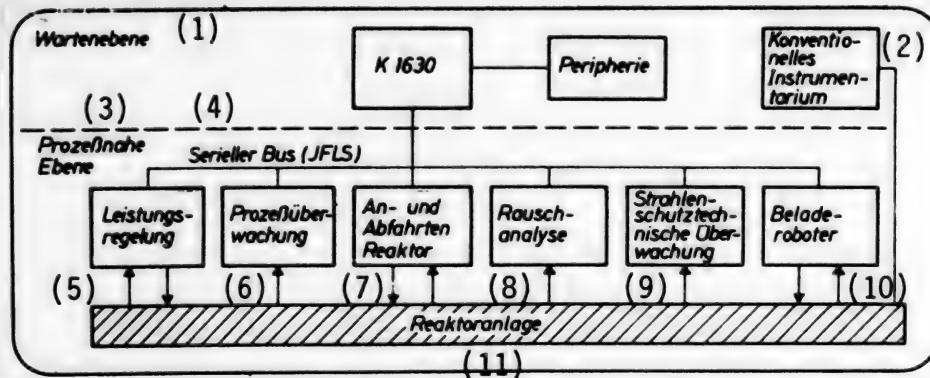


Figure 3: Digital Automation System From the Reactor RFR

Key:

- | | |
|------------------------------------|--|
| 1. Console level | 7. Starting up and shutting down the reactor |
| 2. Conventional set of instruments | 8. Noise analysis |
| 3. Process-proximate level | 9. Radiation-protection monitoring |
| 4. Serial bus (JFLS) | 10. Charging robot |
| 5. Power regulation | 11. Reactor System |
| 6. Process monitoring | |

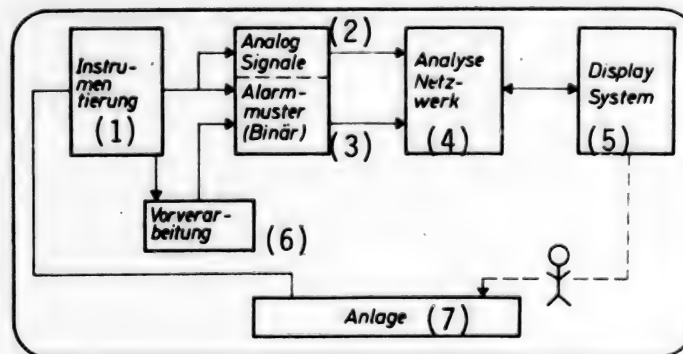


Figure 4: Schema of a Real-time Diagnostic System /1/

Key:

- | | |
|---------------------------|-------------------|
| 1. Instrumentation | 5. Display system |
| 2. Analog signals | 6. Preprocessing |
| 3. Alarm pattern (binary) | 7. System |
| 4. Analysis network | |

As compared to automation systems in power plants, the HIS has some special features:

- A relatively small number of measurement stations (less than 300) is connected.
- The process is spatially very concentrated.
- Essentially one considers measurement variables of the nuclear part of the system.
- The distance between the process, the console, and the computer is relatively short (less than 100 m).

These features naturally influence the implementation of the HIS, but do not impair the value of the test information as regards subsequent utilization of this automation structure in power plants.

The automation tasks cited in the preceding section generally have an autonomous closed character. However, they are strongly coupled together through the process. An automation structure meets the requirements of this complex set of tasks. The device basis for the HIS system that is installed at the RFR reactor is formed by a process computer system type A 6492. This consists of the basic units Ursadat 5000 and the supervening computer K 1630.

The basic units solve the following component tasks:

- acquisition and primary processing of measured data,
- autonomous checking, controlling, and regulation tasks,
- the furnishing of process information for the console.

The console computer primarily must fulfill dispatcher functions. Furthermore, it must be capable to solve specific problems such as:

- real-time tasks with a large expenditure of computer and storage space,
- process-operator communication,
- computer-supported development of monitoring and control algorithms.

The scientific task definition and the system structure (decentralized, hierarchical) demand a powerful operating system. The real-time control program MOEX 1600 and EIEX 1521 and the computers K 1630 and K 1520 serve as a basis for real-time operation. Since the user programs were distributed among the two computer levels to solve the above-mentioned automation tasks, intensive communication between the levels represents a central problem, in addition to such tasks as the acquisition of measured data, its processing, control and regulation, and system tests.

The development and tryout of the HIS automation system will be concluded in 1984. However, as 1983 comes to an end, problem-specific solutions in

terms of hardware and programing are available for utilization in automation projects in industry. This concerns especially programing systems for coupling the HIS with the AUDATEC system that is produced by the Combine Automation System Construction, to couple and operate the individual computers of the HIS via the serial interface for information preprocessing, process monitoring, and control.

A Special Process - the SAAP Real-Time Diagnostic System

Real-time diagnosis, e.g. trouble analysis, is becoming increasingly interesting among the methods of process monitoring and assurance. Trouble analysis integrates the following component functions:

- the acquisition, detection, and evaluation of interferences
- the determination of causes and possible consequential phenomena of these interferences
- the furnishing of a menu of remedial measures.

It is thus an effective means for the system operator. Figure 4 shows the scheme of a special real-time diagnostic system. Trouble analysis is a knowledge-related process, which means that it is based on models of the technological system (model data base) and on the knowledge required for diagnosis.

The SAAP system that is being developed in the Rossendorf ZFK (Central Institute for Nuclear Research) (trouble analysis application program) uses the event graph as the model notation. The nodes of this graph are occupied by sets of events which result, among other things, from primary signals and further process signals (deterministic, stochastic). SAAP comprises the interplay of component processes: automatic, interactive, off-line diagnosis. It is oriented towards a powerful man-machine interface. For certain processes, which are included in the interactive diagnosis and in the off-line model development, remedies from artificial intelligence are supposed to be used, e.g. the presentation and reproduction of knowledge, problem-solving /8/.

Experience

The development of methods of process monitoring and assurance is closely connected with trends in information technology and information processing. This means it is influenced by the further development of components and devices, by the technology for producing programs, and by the power and reliability of digital automation systems.

In particular, the following can be observed:

- a deepening of technical and engineering knowledge through system/process analysis
- improvement of the man-machine relation

- systematic displacement of the boundary between automatic systems and those which depend on the human person, by using the methods of artificial intelligence.

Figure Caption

Frank Baldeweg studied from 1954 to 1960 at Dresden Technical College. After this he was active at the Central Institute for Nuclear Research in Rossendorf of the Academy of Sciences of the GDR. He earned Promotion A in 1967 and Promotion B in 1970. Since 1974, he was working as a college instructor in addition to his regular duties. In 1984, he was appointed Director of Research and Development of the Combine Automation Systems Construction and Director of the Institute for Electrical Systems Berlin.

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Software Development 1985-1990

East Berlin RECHENTECHNIK-DATENVERARBEITUNG in German Vol 21 No 6, 1984
pp 16-18

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/Excerpts/ Making software development more efficient is, now as before, one of the most urgent and timely requirements for information processing.

In the eighties, the problem is to create closed organizational and computer-supported environments for all activities of development, maintenance, quality assurance, and management of software development. Software development systems play a special role here. A series of software development systems has arisen in the GDR in recent years, and these systems have been transferred to a practical utilization. This paper starts from the analysis of the international status and proposes a classification of software development systems. These are derived for the development and application of these systems in the GDR.

Software Development Systems in the GDR 1985-1990

Starting from an analysis of the world status /17/ and of the economic requirements of the GDR, the foundations, performances, and requirements for software development systems are presented in terms of theses. These software systems are to be developed and deployed in the GDR during the years 1985/90. Their requirements are derived.

Thesis 1 (Characteristics 1 through 3)

The four indicated classes of software development systems will also develop in the GDR during the current years and will become more conspicuous. Relative to the application areas and user needs, one must absolutely note that the multiplicity and number of systems does not become greater than necessary. In particular, a restriction of their multiplicity in the area of basis software-oriented systems and thus the uniformity of operating system technology seems necessary.

Thesis 2 (Characteristics 4, 5, 8)

The software development systems must correspond to the technical computer base in the GDR.

Microcomputers, SKR (standard minicomputers) computers, and ESER (uniform data processing system) computers will be highly significant both in individual enterprises as well as in local networks. It is typical to use the

computer configuration at the user, which is intended for the particular application, as a software development system. Additional software is here installed on the computer system during the phases of preparation for use, maintenance, and care. Independent of the computer configuration, intelligent terminals will play an increasing role during the coming years. This will objectively necessitate and technically support a unification of user layers of software development systems.

Thesis 3 (Characteristics 6, 7)

The following concept is to be considered the foundation for the software development systems in the GDR during the years 1985/90:

- modular architecture of the software (program code and documentation),
- freedom of target language for modules on the source code level,
- separate compilation.

This concept is equally suited for electronic data processing systems, mini- and microcomputers, and supports follow-up use and portability on the source module level. For this purpose, standardization of the module concept is absolutely necessary. The module concept should hierarchically support the architectures and should take into account the needs of real-time processing. On the basis of the experience, traditions, applications of computer technology, and compiler availability in the GDR, multi-language facility on the module level must be guaranteed for the application software at least during the coming years. The programming languages FORTRAN, COBOL, PL/1, PASCAL, and macroassembler will here be primarily used as target languages.

Here it must be guaranteed that modules that are written in various target languages will fit into the object level of a computer.

These concepts correspond to international trends for the time period under consideration and are coordinated in the CEMA.

Thesis 4 (Characteristics 9, 11, 12, 13)

A determinate dynamical life-cycle model of the software, corresponding to the concepts of Thesis 3, forms the basis of the software development systems. This model (Figure 2) is coordinated in the CEMA and is described in detail in /12/.

The life-cycle model is a phase model. This means that the individual activities to be performed during software development are collected together into activity groups which lead to one or more component products. The activity groups together with the component products are called phases. A basic concern of this phase organization is to display the material sequence of necessary activities for producing the software. Each phase or component phase is again subdivided into phase steps (Figure 3), which are always ordered in four groups. The phase model permits a dynamical consideration of the software development process. The time sequence of the phases depends

No.	Characteristic	Characteristic Values
1	Programing language linkage	Language-related Not language-related
2	Type of software products	System programs Commercial software Control software Special software
3	Linkage with hardware/ operating system (BS)	System-specific BS-specific Portable
4	Device architecture of the software development program	Insular operation Local computer networks Computer networks with remote data processing
5	Operating mode	Conversational mode operation Batch operation ⋮
6	Structure of the software	Modular Modular hierarchical ⋮
7	Module concepts	Modules with data interfaces Modules with procedure and data interfaces Data capsules Monitors
8	Intermediate linkage of the software	For a target computer For a class of target computers Cross systems ⋮
9	Structure of the software development systems	Monolithic systems Modular systems
10	Architecture of the software development systems	Layer architecture ⋮
11	Supported life-cycle phases	Enumeration of supporting life-cycle phases - Figure 2
12	Quality control	Phase-oriented quality control ⋮
13	Management support	Phase oriented Phase transcending

Figure 1: Characteristics of Software Development System

on the software product being developed, on the development organization, and on the development status. It is to be determined by the user of the software development system. The phase model guarantees the integration of the software management and of the quality control in the phases.

Thesis 5 (Characteristic 10, 3)

Software development systems have a layer architecture in the sense of /7/. In ascending sequence, the following layers appear:

Operating system

This layer is computer-dependent. It contains the operating system core and the system programs.

Management system of the Software development system

The management system contains the data base of the software development system. Here, all results and intermediate results of the software development process as well as their relationships are stored. The management system contains a library concept suitable for the software development process (development-, production-, user-libraries).

Software tools

The software tools the activities of the software developer in the life-cycle phases. They have the character of utility programs. The data supply of the software tools is taken care of by the management system. The further subdivision of this layer in dependence on the type of tools is possible (e.g. /1/).

Control system

The control system activates and reactivates the software tools. An aggregation of individual software tools is possible in the form of prefabricated standard sequences (e.g. method-specific or user-specific sequences).

User interface

This layer is used for communication between the software development system and the software developer. The user interface contains the command interpretation including the guidance of conversational mode interaction and message transmission.

The standardization of interfaces between the individual layers as a precondition for the portability of software development systems and their components as well as making the user layers of software development systems uniform represent urgent necessities.

Figure Captions

Ottomar Herrlich studied from 1950 to 1955 at Dresden Technical College in the area of machine building. From 1955 to 1965 he worked at the Institute for Technical Mechanics at Dresden Technical University. From 1965 to 1969 he was employed in the VEG Germania Karl Marx-Stadt and was concerned with the deployment of computers in the design of chemical apparatus. In 1969 he became instructor and in 1973 he became full professor for programing technology in the section of information processing of Dresden Technical University. He is head of the scientific area of programing technology.

Erika Horn studied at the Leningrad Electrical Engineering College from 1961 to 1970. From 1970 to 1983 she was an employee and department manager for software development systems in the VEB Robotron ZFT (Central Office for Research and Technology). In 1983 she was appointed college instructor for programing technology/software technology at Dresden Technical University, Information Processing Section.

Berthold Tatsch received his degree of Dr. oec. in 1976, working on problems of designing system documentation for the planning and control of production. In this area he was active for many years. Since 1978 he has been employed as area manager for software technology in the VEB Robotron ZFT. The subject of developments of this area concerns technical software development systems for efficient software production.

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CAD/CAM Systems, Software Described

East Berlin RECHENTECHNIK-DATENVERARBEITUNG in German Vol 21 No 6, 1984
pp 19-22

/Article by Prof Dr Herbert Willem, Director, VEB ROBOTRON Combine Center for Research and Engineering; based on contribution to 'INFO 84' conference, 6-10 Feb 84, Dresden Technical University/

/Excerpts/ Base Work Stations

Figure 2 summarizes the most important base work stations, specifying their main tasks. Technical and application details are described in /3/. Figure 2 does not contain production control systems which are to be classified in the CAM category.

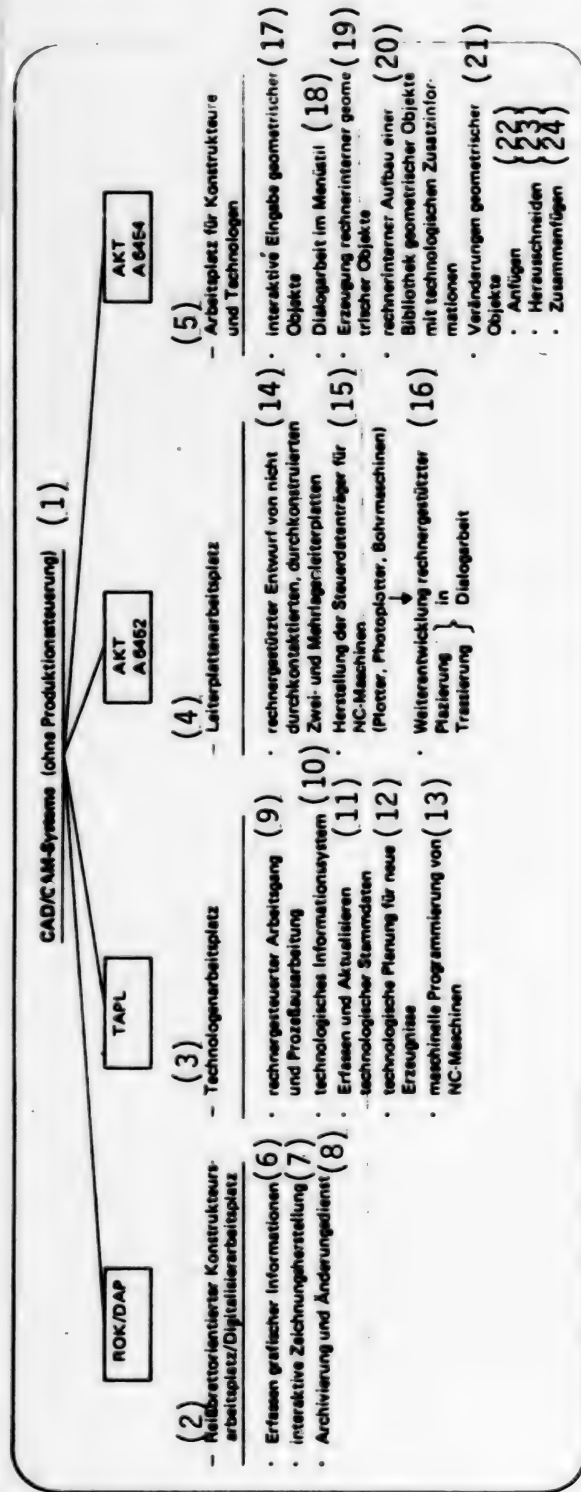


Figure 2: Base Work Stations

Key:

1. CAD/CAM Systems (without production control)
2. Designer work stations/digitalizing work stations
3. Engineering work station
4. Printed circuit board work station
5. Work station for designers and engineers
6. Acquisition of graphic information
7. Interactive production of drawings
8. Filing and alteration service
9. Computer-supported working procedure and process execution
10. Technological information system
11. Acquisition and updating of technological master data
12. Technological planning for new products
13. Machine programming of NC machines
14. Computer-supported drafting of non-through-contacted, throughconstruction double and multiple circuit boards
15. Production of control data media for NC machines (plotter, photoplotter, drilling machines)
16. Further development of computer-supported placement in conversational mode work
17. Interactive input of geometric objects
18. Conversational mode work in the menu style
19. Generation of computer-internal geometric objects
20. Computer-internal construction of a library of geometric objects with technological supplementary information
21. Alteration of geometric objects
22. Add-on
23. Cut-out
24. Join together

The Robotron Combine makes available the KBR A 6492 process computer to control flow processes. This system consists of the K 1630/K 1630 M coupled with the URSADAT 5000, so that the required peripherals for the process automation of flow processes can be furnished.

For discrete production processes, predominantly for machine construction, one uses the data acquisition/information system DIS Robotron A 6422 (see Figure 3). This system is characterized by typical data media and direct information from machines for the organization and control of discontinuous production processes are read or entered and corresponding information outputs can occur on site.

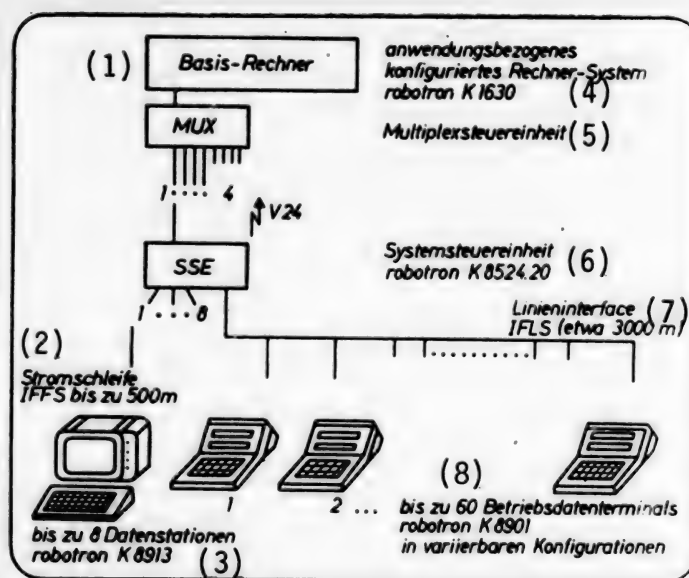


Figure 3: DIS Robotron A 6422

Key

- | | |
|--|---|
| 1. Base computer | 6. System control unit Robotron K 8524.20 |
| 2. Current loop IFFS up to 500 m | 7. Line interface IFLS (about 3,000 m) |
| 3. Up to 8 data stations
Robotron K 8913 | 8. 2 and up to 60 operational data
terminals Robotron K 8901
in variable configurations |
| 4. Application-related configured
computer system Robotron K 1630 | |
| 5. Multiplex control unit | |

The work station for designers and engineers AKT A 6454 permits design work in the conversational mode, and is oriented towards the display screen. Graphic peripherals are especially important here. Below these will be briefly characterized:

- Digitalizing technology
 - High-resolution digitalizing units
 - Desktop units with a working field $420 \times 594 \text{ mm}^2$ (A2 format)
 - Standard unit with a working field $841 \times 1181 \text{ mm}^2$ (A0 format)
 - Working principle; inductive
 - Resolution: 0.01 mm
 - Precision: $\pm 0.5 \text{ mm}$ with pencil
 $\pm 0.1 \text{ mm}$ with cursor
 - Entry of measured values: by points or continuous
- Grid display unit - graphic mode:
 - Picture refresh memory: 640×408 points
 - Representation format: 640×288 points
 - Through roll mode: 640×408 points can be displayed
 - Types of lines: 5
 - Stroke intensities: 4
 - Letter sizes and rotations can be programmed.
 - Other graphic displays are being prepared for production.
- Plotting Technology
 - Digigraf DGS 1208-3.5 g
 - Standard unit with working field $841 \text{ mm} \times 1189 \text{ mm}$
 - Resolution 0.01 mm
 - Maximum character rate 400 mm/s
 - Maximum acceleration 0.3 g
 - Dynamical character precision $\pm 0.1 \text{ mm}$ at 0.2 g acceleration
 - Number of tools = 4

 - Digital drawing table DZT 90 x 120 RS
 - Standard unit with working field $900 \times 1200 \text{ m}$
 - Resolution 0.005 mm
 - Maximum character rate axis parallel 170 mm/s
 - Acceleration 0.12 g
 - Number of tools = 2
 - Other plotters are in development or being transferred to production

Basic Software

All work stations indicated in Figure 2 are equipped with appropriate software /3/. The software structure for the AKT A 6454 will be sketched briefly below (Figure 4):

The software concept comprises the components

- modular operating system MOOS 1600
- graphic basic software
- problem-oriented software with cross-section character
- application software.

Work with graphic peripherals is included in the graphic basic software. It is supported by the graphic basic software

- GKS 1600 - graphical kernel system for displays and plotter
- DIG 1600 - this is software for the digitalizing unit HDG 6401.

The programing system GKS 1600 is used for graphical output on the plotter and display as well as for graphical input from the display. It supports the effort for a uniform graphical interface for user programs, independent of the particular device technology utilized. The GKS 1600 is strongly based on the standard design of the ISO (graphical kernel system, Version 7.0).

The following functions are implemented:

- two-dimensional output
- polygons, circles, circular arcs
- marker sequences
- text simultaneously on several work stations with selection of display possibilities
- input primitives (locator, valuator, choice pick-string)
- picture segmentation
- picture window formation and transformation of the picture
- transformation of picture elements (translation, rotation, changes of scale)
- storage of graphic information in device-independent form.

The GKS 1600 makes it possible to build up structure pictures - each picture can be built up of component pictures (segments). The segments can be stored in device-independent segment memories.

DIG 1600 - Software for the Digitalizing Unit: The special program packet DIG 1600 is available for working on the high-resolution digitalizing unit. It makes possible especially convenient digitalization:

- point-by-point and continuous digitalizing
- automatic point selection during continuous digitalizing
- free positioning of the menu field
- rounding off the acquired coordinates in a selectable user grid
- coordinate transformation
- definition and entry of macros.

Corresponding to the task areas and precision requirements, the following operating modes are possible:

- interval method
- equal step width in the X-direction
- equal step width in the Y-direction
- constant step width in the X- and Y-direction
- time sequence digitalization.

The GBS 1600 - geometric basic software - is an interactive graphic software system which is used to generate, store, process, and display geometric data. It supports the work of the designer and engineer during the design of products, modules, and components. Here, the reuse of elements is included.

In particular, the following functions are executed:

- interactive entry of geometric objects
- conversational mode work in the menu style
- generation of computer-internal representations including modification of geometrical objects
- linkage of areas by operators to form the combination of the average, the difference, and the contact
- adding on of objects to the object currently being processed
- joining of geometrical objects and cutting out geometrical objects from complexes, as corresponds, for example, to the working processes of joining, separating, machining, and drilling
- shifting, rotating, and mirroring of objects, scaling of objects, and production of standard drawings
- management, storage, reading, alteration, erasure of modules in libraries.

The application of the GBS 1600 is matched to the needs of the user of the technical preparation. Simple language means as well as a macro- and picture-program concept are available. This is a system for extensive manipulation of geometric objects and formation of such objects. Scaling and lettering can be used to produce work shop drawings. After the drawing has been completed, it can be outputted through the plotter.

Figure Caption

Herbert Willem graduated in 1976 as Dr. Eng. at Ilmenau Technical College. In 1979 he was appointed honorary professor for process computer technology at Dresden Technical University.

Since 1977, he is director of the ZFT (Central Research Institute) of the VEB Combine Robotron. He works in the areas of computer system development and the application of problem-oriented software to automation tasks.

His current interests lie in work on the planning of hierarchically structured multi-computer systems, the evaluation of system reliability, and the creation of redundant solutions in subsystems.

The photograph shows him in conversation with representatives of Japanese companies at the LFM (Leipzig Spring Fair) in Leipzig (third from the right).

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Effects on Economic Planning

East Berlin RECHENTECHNIK-DATENVERARBEITUNG in German Vol 21 No 6, 1984
pp 9-11

[Article by Prof Dr Gerd Friedrich, First Deputy Director, SED Central Committee Central Institute for Socialist Economic Management; based on contribution to 'INFO 84' conference, 6-10 Feb 84, Dresden Technical University]

[Text] The management and planning of the economy includes the acquisition, transfer, and processing of large quantities of information - to control current economic processes and to shape future ones. No special proof is required that information technology is co-decisive for the efficiency and effectiveness of management. The improvement of information technology in management processes pursues four closely interlinked main objectives:

- to obtain current information for controlling economic processes in a form that is better organized and more easily used;
- to speed up processes of task-related communication and thus to increase the reactive power and operational power of management;
- to gain more and better information for the calculation and testing of alternatives, and thus to improve the preparation for and the reaching of decisions concerning future processes;
- to reduce the social expenditure associated with information processes.

Effects of Microelectronics on Information Processing in Management Processes

Microelectronics initiated a technical development which made it possible to implement information-processing processes in a new manner and with economically reasonable expenditure /1/. The effects of information processing in management processes become especially clear in comparison to the use of electronic data processing during the sixties and seventies;

1. The introduction of electronic data processing systems in management and administration has led to the centralization of special data processing processes, which means the processing of information was separated from the corresponding administrative areas and was transferred to the computer center.

The collection and examination of primary data as well as the evaluation of the computer results remained the task of the management specialists. On the other hand, microelectronics led and still leads to the development of office machines with computer characteristics and thus moves information processing technology to the work station of the specialist. A new generation of office technology results, with autonomous data processing.

2. Microelectronics creates new possibilities for coupling centralized and decentralized data processing, connecting central electronic data processing systems with mini- and microcomputer systems, process computer technology, and office technology. This offers the possibility of combining the advantages of work-station related automation of information processing with the decentralized performance of tasks which are suitably reserved to major EDP installations due to storage capabilities, computing speed, and multivalent utilization of the data. This results in hierarchical systems of data processing - in contrast to the centralized systems of the sixties.

3. While electronic data processing essentially remained limited to the data processing, that is a partial aspect of information processing, microelectronics creates new possibilities of electronic text processing. This again becomes the basis for a corresponding telecommunication and for the juncture of text processing, data processing, and telecommunication (integrated text data networks). The integration of various functions of information processing and transmission in modern communication systems is taking place. These systems are connected together either internally or through public communication networks.

Direction of the Deployment of Modern Information Technologies in Management Processes

Two main directions are delineating themselves for the deployment of modern information technologies in managing the economy: The automation of information processing in connection with production management and in the direct management of production (and in analogous management processes of transport, storage, trade, etc.), as well as office automation, and the processes extending beyond this, such as management and administration.

The first direction is closely connected with the automation of production - the use of data processing and process computer techniques here already proved very effective economically in the past, for instance in the chemical and metallurgical industry, to secure a stable, continuous, and resource-saving mode of operation of entire system complexes. The information technology which built on microelectronics here brought qualitatively new possibilities, especially for technical production management and for the management and organization of production in machine construction and in

analogous discontinuous production processes: Computer-supported systems of production management whose information capacity includes the coupling of design, technological preparation for production, production planning, and production control.

The structure of such an information processing system is favored by the fact that the information associated with production generally has a clear structurization. Connected with this is the build-up of data bases covering all basic information of the production process. With appropriate technical equipment, these data bases can be used multivalently for many other tasks of invoicing and analysis, planning and accounting, the preparation of decisions in other areas of management and administration. For enterprises and combines, the decisive use area of modern information technology in the near future will lie in dispositive aspects of production and the direct management and planning of production, since here the largest economic effects can be achieved.

The second direction, office automation, comprises systems which build on microelectronics, which include text processing, data processing, and telecommunication, and which increase the operational power and efficiency of management and planning in the reproduction process, at various levels of managing the national economy. Office automation differs from the above-mentioned main direction of deploying modern information technologies, to a considerable extent in its conditions:

1. While information processing in the first place is primarily data processing, in the second case text processing stands in the foreground. An estimate 30 to 40 percent of administrative work falls in the area of text processing.
2. The ratio of structured information (that is information that is pre-determined with respect to its subject, form, and time as well as with respect to the manner of its acquisition, processing and transmission, to unstructured information (that means information which appears irregularly, particularly ad hoc and externally) is shifting, within the individual activity levels, considerably towards nonstructured information: At the level of the specialist worker, one can still expect a proportion of about 70 percent structured information. However, for a manager, between two-thirds of 90 percent of the information appears in a nonstructured fashion.
3. An important part of management tasks and of information exchange is executed through verbal communication.

Certain limits in the use of modern information technology in the management process do appear here. These are grounded in the fact that an important part of communication naturally is direct person-to-person communication. The main field for using microelectronics here lies in the area of telecommunication.

Information Processing and Management Decisions

A decisive question associated with the use of modern information technology in the management process is the feedback on management decisions. The improvement of information technology is directed towards better structuring the decision situations and towards increasing the quality of management decisions, especially as regards the time of the decision and the security of the results.

The extent to which this objective is reached in no way depends on the quantity of information that can be made available to management - it depends on the first place on how well it succeeds in preparing information in a form conducive to decision-making, that is processing information by selection and compression so that management has a picture of the decision situation. The practical consequence of this observation is that user-related programs and models of information processing have at least the same rank for the effective deployment of modern information technology as the design of this technology itself /2/. Economic-mathematical models are required, which can deal with the relevant relationships between objectives and resources, between the real and future course of the process, and which can be equipped with real economic information. Thus, decisions can be rendered more quickly and more reliably, concerning the direct management of production, sales and supply processes, and the optimal use of production resources, and other factors. Here lies an essential source for speeding up the reproduction process and for economizing the deployment of resources by the use of modern information technology in management.

Decisions involving the short and medium term will be prepared more adequately, since the required analyses, which previously took weeks or months, can now be available in a few hours. To this is added the circumstance that the coordination between management organs and management levels involving decisions in the process of developing and executing the economic plan can be facilitated and expedited by modern information technology. The information base for long-term effective, strategic decisions can likewise be improved, but the situation here is somewhat more complicated: The main problem lies in the structurization of the particular decision problem, this means in the ability to estimate the contextural relationships of objectives, resources, and variants for future economic processes. With such decisions concerning future economic processes, the capabilities of modern information technology primarily lie in providing answers to questions in man-machine dialogue: What would happen if? But the foundation of such a decision, which is based by playing through the variants, depends on the quality of the initial information. Obtaining this information to a significant extent is itself the result of creative human thought.

Previous experience in using electronic data processing /3/ clearly indicates that the efficiency of automating the information processing itself depends on the associated organizational problems (in a comprehensive sense - this means the redesigning of jobs, of user-related software, of the qualification of the carders up to and including changes in the production and management

organization). To a still greater extent this also holds for information systems based on microelectronics since here the integration level of automated information processing (especially through the linkage of centralized and decentralized data processing as well as through the linkage of text processing, data processing, and telecommunications) increases significantly and, at the same time, automated information processing takes place at the individual work stations. This is not only connected with new management and grand organizational problems but also results in an increase of the final users influence on and responsibility for the planning and organization of information processing.

Since individual usage, that is insular operation, generally yields only a small effect, enterprises and management organs must proceed according to a clear overall concept when deploying this technology. Careful process analyses, which especially provide information concerning information flows connected with performance and management processes, concerning task-related information needs, and the mode of information processing and transmission, are an important basis for this. They also form the precondition for determining the most effective deployment areas of the new information technology, for correct selection of devices, for organizational planning and the matching of working sequences to the device technology and to the planned information technology.

Current Requirements

The system approach in the truest sense of the word is required already for process analyses but still more urgently for the deployment concept. This is necessary to meet current requirements which already now affect numerous enterprises and combines in data processing /4/. These include

- to create complex technical data solutions which simultaneously assure that already entered or machine-generated data can continue to be processed computer-internally or that machine-readable data media can be interchanged and remote data processing can be used to a greater extent
- to use data bases for integrated EDP projects and to secure the thoroughness of planning, accounting, management, control, and termination of production (or analogous performance processes)
- to make data acquisition more efficient, to increase the level of the starting data, and to improve the currency of the master data
- by using further information technology, to increase the integration level of automated information processing, from technical preparation for production through production itself up to sales and supply processes.

The reshaping of information technology is taking place on three levels - on the level of the user of electronic data and text processing, on the level of the networks, that means communications technology, the computer association systems, communications technology, and on the background level,

that is the creation of data bases, information funds, electronic files. This reshaping of information technology is connected with considerably economic expenditures - but it brings new opportunities of making even more efficient the management and planning of the reproduction process in the economy, and to increase the efficiency of the economy.

Figure Caption

Gerd Friedrich graduated in 1955 as Dr. oec. and in 1961 as Dr. habil. at the College for Economy "Bruno Leuschner" in Berlin. In 1961 he was appointed regular professor. Since 1968 he has been active as representative of the director of the Central Institute for Socialist Economic Management at the Central Committee of the SED. He was appointed corresponding member of the Academy of Sciences of the GDR in 1975. Gerd Friedrich first worked in the areas of industrial economics and the management of socialist industry. The points of emphasis of his current and further activity are basic questions of socialistic economic planning, the work of the combines, and problems of decision theory.

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8348
CS0:2302/69

COMPUTER CENTER SERVES 11 ENTERPRISES

East Berlin RECHENTECHNIK-DATENVERARBEITUNG in German Vol 21 No 2, 1984
pp 23-25

[Article signed 'Pa.']

[Text] An ADN (German General News Service) report set it off: The joint computer center for 11 enterprises was erected in the Auerbach area.

Now enterprises previously already "got together" and divided among themselves the investments for a computer center. As a rule, two partners were involved here. But how do 11 enterprises bring their interest "under one roof"? How do they divide investments and computer time? Are planning and programming services furnished centrally or by each enterprise itself?

With these and a series of other questions we drove to Auerbach to be informed on site. Our objective in Auerbach was the VEB United Underwear Factory, an enterprise in the Cotton Combine, the managing enterprise of the joint computer center (GRZ) in Auerbach.

Comrade Reibel, director of the GRZ, informed us concerning the origin history, tasks, and initial experiences of the GRZ.

A Joint Decision Formed the Basis for the GRZ

Auerbach is predominantly settled by small industry. Here, enterprises in the finishing industry, surface fabrication, and knitting predominate. The size of the enterprises fluctuates--the number of employees is between 200 and 2,000. For the small enterprises with 200 and 500 employees, it is impossible, in terms of personnel and finances, to construct their own EDP departments. To make the management and administration processes more efficient, EDP had to be introduced in the enterprises, already because, beginning in 1984, accounting and statistics become deductible according to the full nomenclature. In addition, the effort for administration presents a scarcely soluble problem if it is handled manually.

Since the smaller enterprises themselves were not capable of utilizing EDP for their tasks, the decision was made to set up a joint computer center. The choice fell to the VEB United Underwear Factories. The reason for this was that, within the framework of light industry, this was the only enterprise in the Auerbach area which already had a computer center available. Since 1976, a Robotron 4200 has been used in an EDP department which comprises 20 persons.

In February 1981, a program for developing the output of light industry was decided upon by the Council of the Karl-Marx-Stadt area, the regional leadership of the SED, and the Ministry for Light Industry. The core of this program is numerous measures of territorial rationalization. And one of these measures of territorial rationalization is the formation of the GRZ in Auerbach. The 11 participating enterprises have a total of about 10,000 employees. The largest enterprise is the VEB United Underwear Factories with more than 2,000 employees. The smallest has fewer than 200 employees. Finishing-, knitting-, and weaving enterprises from four combines are joined together in the GRZ. A particular specific of the enterprises is that nearly all employ at-home workers. Furthermore, on the basis of their origin, and their formation in the context of economic organization, the plants are splintered into extremely many production sites. Naturally, this creates problems in setting up a data processing center.

The building at 9 Goethe Street was selected to house the GRZ. It was converted within a year. It was modernized, and the computer system was installed. During the building project, enormous extra services were rendered by all employees of the GRZ in order to adhere to the deadline on the occasion of 1 May 1983. Thus, the GRZ could be opened on 20 April. Comrade Reibel evaluates the formation of a two-man managerial staff as a special advantage in the phase of designing the GRZ. This consists of an investment engineer and himself, as the future manager of the GRZ. Thus, as a subsequent user, he could influence the deployment of investments.

Joint Investment Makes It Possible For Smaller Enterprises To Introduce EDP

After it was clear which enterprises would participate in the GRZ, a cooperative community was born in March 1982. Its members were the 11 enterprises. The cooperative council functioned as the organ of this cooperative community. Here, the directors of the enterprises and the managers of the working staff were represented. The investment was accomplished as a joint investment, i.e. each of the 11 enterprises furnished a portion of the investment. The investment means were planned by the enterprises and were then transferred to the special account of the joint computer center, which was administered by the VEB United Underwear Factories. The VEB United Underwear Factories, as managing enterprise, is accountable for the fiscal means to the cooperative council. The investment proportions are divided up according to the size of the enterprises, relative to their number of employees. The available computer time is also divided in accord with this code. An organizational contract regulates the basic collaboration of the cooperative community. There are bilateral contracts between the VEB United Underwear Factories and the respective user operations for using the GRZ. The central department of EDP planning implements the planning tasks for all enterprises participating in the GRZ. No data processing is being planned for the individual enterprises. Working teams were formed to work out the plans. Members of the working teams are technical people of the respective enterprises and the official organizers of the GRZ. The content of the E3 is set in the working team - in the practical operation at Auerbach, it looks as if the E3 is being worked out and defended before the committee on the part of the GRZ, while utilizing directives from the technical departments. The stages E4 and E5 follow.

The enterprises are obliged to create the preconditions for introducing EDP projects, and implementing these preconditions with the GRZ.

Special wishes which exist within the enterprises beyond the central projects are likewise fulfilled in the GRZ, within the framework of free programming capacity.

The entire project is free of charge to the enterprises. The Cotton Combine is carrying the cost.. Only the computer time actually used must be paid for.

The planning of economic projects is a topic of government planning. In 1984, the government-planning topic "territorial rationalization by the construction and efficient utilization of a joint computer center in the Auerbach area" will be completed. During the first half year of 1985, the projects will then be introduced in the enterprises. Here, a few of them have already been implemented at the present time: Thus, the basic-means programs are already running, and employee accounting and sales are directly in preparation. After the government-planning topic has been concluded, the GRZ will handle predominantly problems of production administration, organization, invoicing, and control. This is new territory for the data processing people at the VEB United Underwear Factories. Of course, initial experience is available with production control, but this experience is too specific to the enterprise to be transferable to the conditions of other enterprises participating in the GRZ. By 1986, a merchandise production growth of 2.4 million marks and the elimination of 20 jobs is to be achieved.

Decentralized Data Acquisition in the Enterprises

The work of the actual computer operation is oriented towards decentralized data acquisition, i.e. each enterprise enters its own data itself on machine-readable data media. This data medium is then transmitted to the GRZ, is shipped there, or its content is transferred.

In remote data transmission, the people at Auerbach, however, are facing a problem. The German Post Office does not allow the modems TAM 601 in the Karl-Marx-Stadt area for remote data transmission in direct dialing traffic. The modem MD 101 is permitted, but only a small number of them are available to the GRZ, since it is no longer being produced in the GDR.

A uniform device technology is centrally provided for decentralized data acquisition - the PBT 4000. Interchangeability is thus guaranteed in the case of accidents.

Two programming systems were created for data acquisition, the DESY1 System which is oriented towards paper tape and the DESYM System which is oriented towards cassettes. The data acquisition systems are written so that they contain primarily data checks. After processing at the computer, a data medium for the results can optionally be created, e.g. a printed list, or the results can be outputted on tape cassette for further processing at the PBT 4000. The data can be transmitted via PBT-PBT to enterprises who have remote transmission capabilities, and can be outputted by a printer connected to the terminal.

Comrade Reibel evaluated current experience with the GRZ as excellent. This form of joint utilization of computer technology has proven itself. All the participating enterprises are striving for good cooperation. The fact that other enterprises have come forward to collaborate in the GRZ also indicates its success. However, for reasons of capacity, they can no longer be considered.

Other joint computer centers will arise in light industry. The Auerbach people are glad to communicate their experience to other enterprises who also wish to set up a joint computer center.

Figure Captions

Our partner in the discussion, Volker Reibel, (33) was born in Auerbach. The educated cattle man studied at "Carl Schorlemmer" Technical College at Leuna-Merseburg, and concluded his studies in 1975 as certified mathematician. After this he worked at the VEB Machine Tool Construction Combine "Fritz Heckert" in Auerbach. In 1976 he transferred to the VEB United Underwear Factories. He first worked as manager of the computer station, later as manager of the computer center. In July 1983, he was appointed director of the joint computer center.

PBT 4000 terminals for remote data transmissions in the joint computer center at Auerbach

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CSO: 2302/68

CONVERSATIONAL DATA ENTRY DEVICE DEVELOPED

East Berlin RECHENTECHNIK-DATENVERARBEITUNG in German Vol 21 No 2, 1984
pp 25-26

[Article by Dieter Kolb, Dr Wilfried Naumann, Ulrich Geisler, Central
Research Institute for Transportation, Center for Process Automation]

[Text] Task Definition

The broad utilization of modern microcomputer technology for making technological processes more efficient requires efficient methods for the acquisition and transmission of information. Because of the specifics of technological processes, it is often impossible to acquire measured data automatically. To gather the information, it is necessary to use the human person with his sense organs. Work then becomes efficient only if the tasks of data acquisition can be supplemented by dispositive tasks. This requires apriori an online coupling with the processing computer and an information flow in both directions. In the case of processes with a surface character, such as are typical in traffic, the transmission of data is subject to stringent requirements. Mobile or portable terminals must be used for dialogue with the processing computer. A portable conversational data entry device with an adaptable data broadcasting unit was developed for this purpose at the Center for Process Automation in the Central Research Institute for Traffic.

The following effects can be achieved by using this technology:

- decentralized on-line data entry
- extensive error detection during data entry
- high currency of the entered data
- decentralized data interrogation from the processing computer.

This creates favorable use possibilities for making technological processes more efficient, even in many other areas of the national economy, in addition to traffic, thus for example:

- construction
- chemical industry
- metallurgical industry
- brown coal combines

-agriculture and forestry.

Technical Implementation

System Structure

The conversational data entry unit consists of one or more portable data radio terminals (DFT) and a stationary data radio concentrator (DFK). The DFT's work time-multiplexed in competitive operation on a radio channel together with the DFK. The transmission sequence is controlled through a data transmission procedure. The data are transmitted asynchronously and serially with a speed of 1200 bit/s. The bit and character synchronization is implemented by software. To avoid wrong data, which arise through transmission errors on the noisy radio channel, seven information bits are always assigned to a control byte (cyclic coding). Thus, up to four bit errors can be detected per character. A correction is made by means of repetition.

By switching over to another radio channel, voice traffic with other employees (e.g. dispatcher) is also possible with the DFTs.

It is possible to connect commercial voice radio units of the 2-m 0.7-m radio band to the DFT or to the DFK without modifying the voice radio units (adaptive data broadcasting).

Data Radio Terminal

A DFT consists essentially of the modules:

- single-chip microcomputer with program and data memory
- memory control
- keyboard with drive
- display with drive
- modem and radio device control
- power supply with voltage stabilization.

The system program is stored in a 2K byte EPROM. It manages the following tasks:

- input control
- display control
- intermediate storage of entered data
- coding and decoding of characters
- radio unit control
- transmission/reception of data records corresponding to the data transmission procedure.

The flat film keyboard utilized at the 40-digit LCD display permits the processing of alphanumeric and other characters. The grid dimension of the keyboard is 20 mm. The key size and spacing are thus sufficiently large to facilitate reliable operation even with working gloves and to minimize the accidental activation of adjacent keys. If this does occur, however, a correction can

be performed at any time (until the data record is transmitted). This is supported by the function keys for cursor control, for line switching, and for deleting individual lines. By a line is here understood a data record of 20 characters (places). The display is divided into two areas, each with 20 places, and the data buffer with a maximum of 100 characters is divided into five areas. The data buffer is only one part of the RAM area which comprises 1 K bytes. The RAM contains also the working cells and decoded information during transmission/reception.

After the transmit key has been activated, no further entry is possible. The transmission process and up to three repetitions take place automatically. A cyclic availability character, transmitted by the DFK, the data transmission procedure, and a DFT-specific adjustable identifier guarantee that several DFTs do not transmit at the same time.

The "general erase" key or switch-on and switch-off put the DFT into its base position.

Rechargeable NC batteries produce two operating voltages, +5V and -5V. The batteries guarantee uninterrupted operation for eight hours.

The DFTs are thermally insulated and can be used in a temperature range from -20°C to +40°C. They meet protection level IP 54 and furthermore are resistant against vibration and shock.

The dimensions are:

width X depth X height
360 mm X 260 mm X 125 mm.

Together with the batteries the unit weighs 3.95 kg.

A DFT is carried in front of the body by a carrying frame. As a result of an operating trial, and taking into account the requirements of occupational medicine and of psychology, the following options have also been implemented:

-For a better weight distribution, the batteries can also be carried in a housing on the back.

-To facilitate the performance of additional tasks by the operator, it is possible to use the DFT on a mobile carriage.

-To increase the operating reliability of the flat film keyboard, an acoustic feedback was introduced by using the operating part of the radio units.

Data Broadcasting Concentrator

The DFK in its basic equipment consists of K-1520 plug-in units.

Furthermore, the DFK modules comprise a modem and a radio device control as well as a power supply. The power supply modules (STM) of the K 1510 are used.

All STMs are operated through a common network filter. All modules are installed in an EGS modular housing and are connected to the network through a common protective contact connection.

The 1 K byte RAMs of the ZRE card are used as working cells and for the intermediate storage of coded data records from and to the DFT. The 2 K byte RAM area of the OFS card is divided into a total of 16 areas. These can optionally be used to buffer the decoded messages for input or output.

Adaptation to Different Applications

A DFT has available a memory region of 2 K bytes, which can be occupied by plugging in an EPROM with a specific user program. This results in possibilities for syntactic and logical testing of the entered data, but also for operator guidance. Input errors can be displayed, parts of data records can be supplemented, incorrectly entered data can be identified, and messages received in the conversational mode can also be responded to appropriately.

The DFK offers similar capabilities by using the 6 K byte EPROM of the OFS card or, beyond this, through further plug-in stations for program or data memories or for connecting control units of peripherals. Thus, final processing or further preprocessing of the acquired data can take place in the DFK.

At the present time, the activation of a V.24 interface with or without the AP-62/64 procedure, and software support of the connection of a teletype has been implemented. A printed circuit card has also been developed which here makes it possible to connect two teletypes via the serial interfaces of the ASV card.

The connection of a supervening EDP system via the V.24 interface makes possible especially manifold possibilities of data processing.

To guarantee optimal reception conditions for data broadcasting, the respective use area must be scaled in accord with radio requirements, and it is suitable to install a raised antenna.

Address of the Developing Agency

Central Research Institute for Traffic, Center for Process Automation, 1017 Berlin, Markgrafendamm 24.

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CSO:2302/68

EDP SYSTEMS FOR MATHEMATIC-ECONOMIC MODELLING DISCUSSED

East Berlin RECHENTECHNIK-DATENVERARBEITUNG in German Vol 21 No 6, 1984
p 35

[Article by Dr Volker Oppitz, Dresden]

[Text] The Mathematical-Economic-Modelling Working Team of the Ministry for Higher and Technical Education provided informative consultation at the VEB Robotron Electronics Radeberg (RES) on 5 May 1983, on the following problem areas:

1. Status of EDP application in the VEB RES
2. The utilization of the complex method for plan substantiation in accord with the objective of maximum performance continuity
3. Inspection of production control and wage calculations with little paper-work
4. Methodological status of plan accounting and aspects of the application of the complex method.

As an introduction, Comrade Kunath, director for economic data processing, discussed basic problems of the operational organization. Because of the significance of the management and process organization for data processing planning, 15 percent of the employees of the organization and computer center work in this area. The process organization should speed up the processing sequence and should make it more efficient by using EDP solutions. The measures to achieve greater efficiency in the area of management organization are guided centrally by the combine with the objective of securing an organization and framework structure that is uniform within the combine and of minimizing managerial and administrative labor.

The task areas of planning and programming occupy a fraction of 22 percent and the computer center occupies a fraction of 58 percent of the employees of the ORZ (Economic Computer Center).

The BASTEI data base contains the basic data media for work-plan master cards, parts lists, object and work station information.

The data are mainly processed in the projects:

- materials planning and disposition (DEBAMO)
- production planning
- preliminary price-plan calculations
- inventory of unfinished products (UE inventory)
- production control (detail planning , control and guidance of parts production)
- machine order assignments and acquisition of wage data with minimal paperwork.

At this time, DOS 1.7, and later on DOS 3.0 are used as the programming system.

The change time involved with BASTEI, using the data entry unit DEG 1372, currently is five days. With the future use of the technological work station with a video screen in the online system, this will be reduced to one day.

Starting from the good status of data processing in the enterprise, its economic director, Comrade Mauksch, presented possibilities in solution paths for the further qualification of the management and planning in the enterprise.

The center point consisted in the economic task of significantly improving the cost/result ratio by means of improved performance continuity of the enterprise. Performance continuity is regarded as a management task, to substantiate high and real plan objectives, to prescribe such objectives, and to achieve these materially over the planning gear in each decade.

One of the main tasks here is supposed to consist in determining how government tasks, assignments, and competitive objectives are to be implemented under the aspect of performance continuity with given funds.

In preparing for the planning year 1984, the following management points occupied the foreground:

- to optimize production and sales of industrial goods
- to organize production control by using pure technology so that the plan of industrial goods production (IWP) according to decades is fulfilled.

In preparing future planning years, performance reserves are to be opened up by science and technology; the basic requirements for the planning part of science and technology as well as the remaining parts of the operating plan must be specifically subordinated to general target functions. To implement the plan itself, it is necessary to prepare a concept which can be executed with constant feedback relative to the production situation.

As regards the methodological status of plan accounting and as regards the transition to the complex method, Comrade Kunath presented the opening up of performance reserves as a main objective.

The following points were proposed for discussion, by the head of the working team, Professor Wunderlich:

- problems of applying data processing and making management and planning more

efficient

-questions connected with the application of balanced plans and the utilization of the complex method.

Dr. Drewel, Karl-Marx-University Leipzig, also emphasized that a modern EDP system exists in the enterprise. Measures for applying a balancing model were introduced on a supervening level. These form an important precondition for achieving stable optimization results upon transition to the complex method in the enterprise. The coordination between the combine and the combine enterprises is then secured through solid framework conditions, since plan optimization can be performed exactly only if the combine management guarantees a sensible inclusion and managerial establishment of the plan on the enterprise level.

Dr. Lassmann, Martin Luther University Halle, likewise thinks that an excellent data base exists in the enterprise. Step by step it must be possible to build up a manager-model dialogue for working out the plan. Experience has shown that the complex method is also suitable to work out medium-term plans. Results can be presented in a few hours.

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GERMAN DEMOCRATIC REPUBLIC

BRIEFS

LARGEST GDR IC PRODUCER--The VEB Microelectronics "Karl Marx" Erfurt, a factory of the Microelectronics Combine, can be certified to be the largest manufacturer of integrated circuits in the GDR. Among the 7,500 microelectronics technicians, 1,000 of who are apprentices, the dominant age range is twenty to forty years. The technical intelligentsia which in the beginning years of the Republic made up the staffs of a handful of universities and professional schools has through the years increased in number to 2,000; and noteworthy is the fact that the average age of this group is just 36 years. [Excerpts] [East Berlin RECHENTECHNIK-DATEN-VERARBEITUNG in German Vol 21 No 6, 1984 p 2] 9160

HUNGARY DELIVERS 50th ESER COMPUTER--At the VEB Combine Progress Agricultural Machines Neustadt in Saxony, the 50th ESER computer installation from Hungarian Videoton AG was delivered to the GDR at the beginning of March. The Model EC 1011 is a component of a rationalization complex which is presently being installed in several factories of the agricultural machinery combine. In the second half of 1984, a software system "Technological Manufacturing Foundations" jointly developed by specialists of Videoton AG and VEB Progress will undergo test runs in large factories using three EDVA EC 1011 computers. Upon successful completion of the work related to creating the hardware and software prerequisites, it is planned to effectively support the production of mowing machines of various models and variants, especially in the areas of technological preparation, mechanical documentation, material disposition and daily management and control tasks. [Text] [East Berlin RECHENTECHNIK-DATENVERARBEITUNG in German Vol 21 No 6, 1984 p 2] 9160

GDR-USSR COMPUTER TRADE AGREEMENT--Agreements concerning the reciprocal deliveries of ESER computers amounting to 268 million rubles have been signed between Elektronorgtechnika and Robotron Export-Import in Moscow. Under the agreements, the USSR will deliver 12 Model EC 1035 computers to the GDR in 1984, and the GDR will export 76 Model EC 1055M computers to the USSR. At the same time, the VEB Combine Robotron will deliver to the USSR under a longterm agreement the initial units of a computer-controlled system for rationalizing and automating banking procedures. This system is to be used in credit and finance institutions in the USSR and is based on the EC 1055M microcomputer systems of the Robotron Combine and on components of the product program of the decentralized Datentechnik. [Text] [East Berlin RECHENTECHNIK-DATENVERARBEITUNG in German Vol 21 No 4, 1984 p 2] 9160

SUCCESSFUL CAD/CAM USE REPORTED--In the "Fritz Heckert" Combine Karl Marx Stadt productivity has been increased--for example, by a factor of ten in dimensioning frames--through computer aided design. By using the computer optimization module, it was also possible to reduce the previous complement of 88 gear types per machine to just 38. Computer-aided design also yields economic gains for technical planning and production flow. CAD/CAM solutions realized using the Robotron AKT 6454 automated work station yield not only drawings for parts and subsystems but also planning sheets, material standards and punched tapes for numerically controlled machines. With this computer-aided design and computer-aided technical planning, productivity can be--in line with international experience-- increased by a factor of three compared to conventional design work and rework, and about half of the previously employed work force can be released for other jobs. [Text] [East Berlin RECHENTECHNIK-DATENVERARBEITUNG in German Vol 21 No 3, 1984 p 2] 9160

COMPUTER NETWORK INFORMATION PUBLISHED--At the beginning of 1984, a new volume began in the series of information articles relating to the work of the VEB Lead Center for Applications Research (LFA) in the VE Combine Data Processing. In the first article are presented requirements on programmable controllers (PCs) for computer networks; from these are derived generalized requirements for communications tasks, equipment and technical programming plus specific requirements for PCs used in the computer network of the VE Combine Data Processing. The second article treats the application of the PTS component of the virtual machine system SVM/ES for the development of OS/ES programs. PTS has been in use since 1981 in the VEB LFA; the accumulated experience is discussed, and a brief outlook concerning further development of the PTS component is presented. The third article with the title "Standardization in Data Processing Project Management and System Support Development--A Compelling Necessity" features the development of work standards as a focal point of standardization work in the Data Processing Combine. A prerequisite for automating data-processing project management and processing procedures is standardization. [Text] [East Berlin RECHENTECHNIK-DATENVERARBEITUNG in German Vol 21 No 3, 1984 p 2] 9160

DATA PROCESSING CENTER DESCRIBED--In the VEB DVZ Leipzig within the framework of an industrial test program, the conversion of two large DOS projects to the DOS-3 operating system was successfully accomplished. In addition three new DOS-3 projects have been initiated. The stability of the projects is positive; run-time saving amounts to about 20 percent. To date, the following components have been tested and put into service by the DVZ Leipzig: DOS-3 basic operating system; DOS-1 emulator; LUISA dialog system and BATCH control (queuing technology). The RPG-2 programming language used by the Robotron Combine was derived by them from DOS 3 and has been adapted to the OS/ES operating system. Practical application demonstrated a series of good results such as suitability for at least 80 percent of all applications, a 50-percent saving of programming time (80 percent in special cases) plus an analogous run-time ratio of RPG-2 Programs compared to ASSEMBLER programs. On May 15 and 16, 1984, a KdT symposium will be held at the VEB DVZ Leipzig for experienced RPG programmers on the topic "Experience in the Application of The Program Generators RPG-2/AUTOREPORT in OS/ES and DOS-3/ES." For information and registration contact VEB DFZ Leipzig, Abt. FP, 7010 Leipzig, PSF 627, Tel. 7970 256. [Text] [East Berlin RECHENTECHNIK-DATENVERARBEITUNG in German Vol 21 No 4, 1984 p 2] 9160

SOLDERING WITH LIGHT--Diode chips are soldered with light at the VEB microelectronics Muelhausen in the pictured device (the photo shows the research unit exhibited at the MMM Center). Since conventional soldering equipment impeded smooth production flow, the improvement of this technology was taken up as a task in the district's youth objective "Rationalization of Diode Manufacturing". In the light-soldering unit, the radiation from a small 250-watt infrared lamp is focused on the tiny semiconductor platelet by a very accurate parabolic mirror with a gilded surface. With precise speed control, the chips are fed through the light beam resulting in uniform solder joints between the chip and the connector wires without overheating the sensitive semiconductor material. [Leipzig URANIA in German Vol 60 No 5, 1984 p 19] 9160

MOTORS FOR ROBOTS--Electric motors for articulated robots have to have a slender, compact rotor in order to have a low mass moment of inertia. They must have a high over-current capacity to handle control transients, and they must be compact so that they do not interfere with the robot's yawing and pitching motions. The two motors RSM 10 and RSM 60 (10 and 60 specify the mass-handling capabilities in kg) fulfill these requirements. These motors were developed to production maturity in just 6 months by a youth research collective in the VEB Research and Development Center for Electrical Machinery in Dresden. In the critical parameters, these new robot-specific motors are superior to comparable products of other countries. [Text] [Leipzig URANIA in German Vol 60 No 5, 1984 p 19] 9160

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31 AUGUST 1984